



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LM6029ACW-A

LCD Module User Manual

Prepared by: Gonghuimei Date: 2021-10-14	Checked by: Date:	Approved by: Date:
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Rev.	Descriptions	Release Date
0.1	Preliminary release	2021-10-14

Table of Content

1. Basic Specifications.....	3
1.1 Display Specifications.....	3
1.2 Mechanical Specifications.....	3
1.3 Block Diagram.....	3
1.4 Terminal Functions.....	4
2. Absolute Maximum Ratings.....	5
3. Electrical Characteristics.....	5
3.1 DC Characteristics.....	5
3.2 LED Backlight Circuit Characteristics.....	5
3.3 AC Characteristics.....	6
4. Function specifications.....	7
4.1 Basic Setting.....	7
4.2 Resetting the LCD module.....	7
4.3 Display Memory Map.....	8
4.4 Display Commands.....	9
5. Design and Handling Precaution.....	10

1. Basic Specifications

1.1 Display Specifications

- | | |
|---------------------|--|
| 1) LCD Display Mode | : FSTN,Positive, Transflective |
| 2) Display Color | : Display Data = "1" : Dark Blue (*1) |
| | : Display Data = "0" : Light Gray (*2) |
| 3) Viewing Angle | : 6H |
| 4) Driving Method | : 1/65 duty, 1/9 bias |
| 5) Backlight | : White LED backlight |

Note:

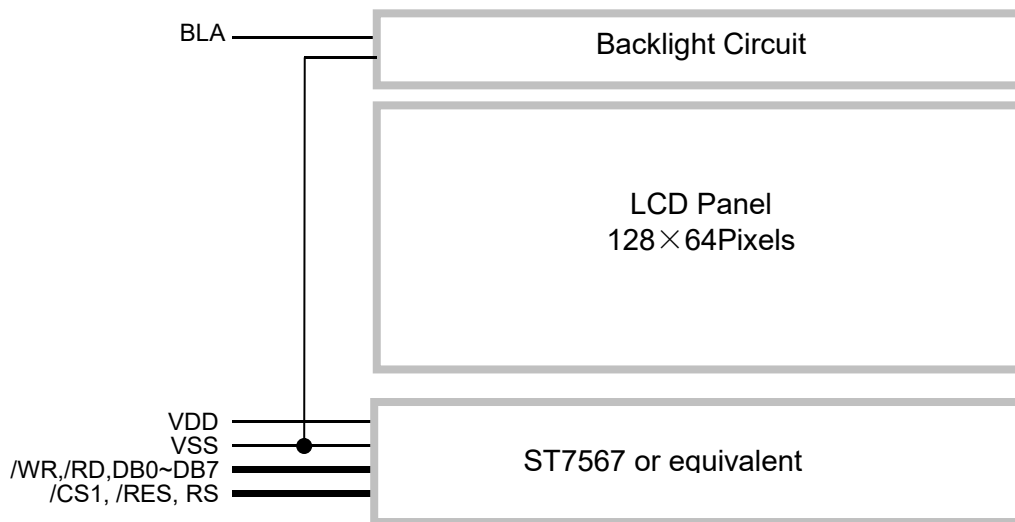
*1. Color tone may slightly change by Temperature and Driving Condition.

*2. The Color is defined as the inactive / background color

1.2 Mechanical Specifications

- | | |
|----------------------|--|
| 1) Outline Dimension | : 59.6 x 50.6 x 8.7MAX (mm) |
| | (See attached Outline Drawing for details) |

1.3 Block Diagram



1.4 Terminal Functions

Pin No.	PIN Name	I/O	Descriptions
1	VSS	Power	Negative power supply, 0V
2	VDD	Power	Positive power supply
3	DB7	I/O	8-bit Data bus;
:	:		Three state I/O terminal for display data or instruction data
10	DB0		When /CS = H; DB0~DB7=High Impedance
11	/RD	Input	Read enable input, active LOW
12	/WR	Input	Write enable input, active LOW
13	RS	Input	Register Select RS = H, Transferring the Display Data RS = L, Transferring the Control Data
14	/RES	Input	Reset signal /RES = L, Initialization is executed /RES = H, Normal running.
15	/CS1	Input	Chip Select /CS1=L, enable access to the LCD module /CS1=H, disable access to the LCD module
16	BLA	Power	Positive power for LED backlight

2. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	+4.0	V	$V_{SS} = 0V$
Input Voltage	V_{IN}	-0.3	$V_{DD}+0.3$	V	$V_{SS} = 0V$
Operating Temperature	T_{OP}	-20	+70	°C	No Condensation
Storage Temperature	T_{ST}	-30	+80	°C	No Condensation

Cautions:

Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

3. Electrical Characteristics

3.1 DC Characteristics

$V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition / Application Pin
Operating Voltage	V_{DD}	3.0	3.3	3.6	V	VDD
Input High Voltage	V_{IH}	$0.7 \times V_{DD}$	-	V_{DD}	V	/RES, /CS1, RS, D0~D7, /WR, /RD
Input Low Voltage	V_{IL}	V_{SS}	-	$0.3 \times V_{DD}$	V	
Operating Current	I_{DD}	-	0.15	1.4	mA	VDD

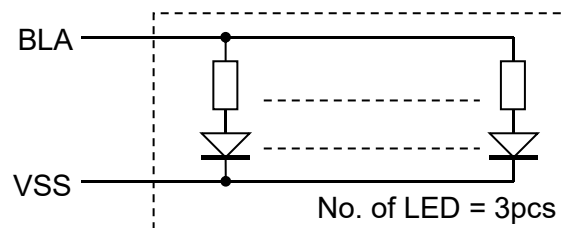
3.2 LED Backlight Circuit Characteristics

$V_{SS}=0V, I_{f_{BLA}}=39mA, T_{OP}=25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Forward Voltage	$V_{f_{BLA}}$	-	3.3	-	V	BLA
Forward Current	$I_{f_{BLA}}$	-	39	60	mA	BLA

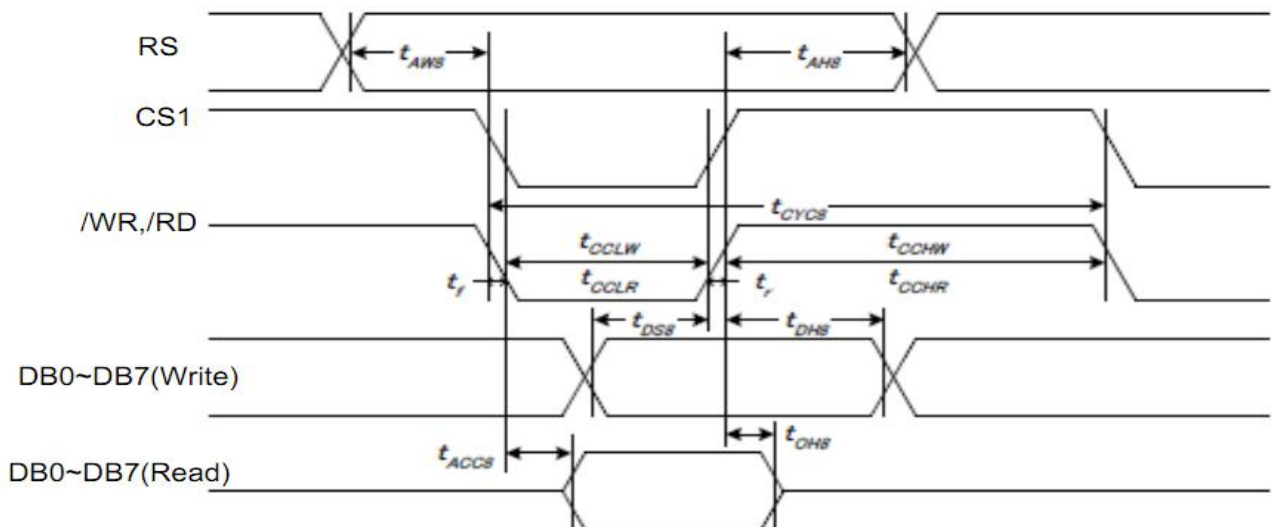
Cautions:

Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.



3.3 AC Characteristics

3.3.1 8080 Mode System Bus Timing



$V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25^{\circ}C$

Item	Symbol	MIN.	TYP.	MAX.	Unit
System cycle time	tcyc8	240	-	-	ns
Address setup time (RS)	taw8	0	-	-	ns
Address hold time (RS)	tah8	10	-	-	ns
Control LOW pulse width (/WR)	tcclw	80	-	-	ns
Control LOW pulse width (/RD)	tcclr	140	-	-	ns
Control HIGH pulse width (/WR)	tcchw	80	-	-	ns
Control HIGH pulse width (/RD)	tcchr	80	-	-	ns
Data setup time	tds8	40	-	-	ns
Data hold time	tdh8	20	-	-	ns
/RD access time (*2)	tacc8	-	-	70	ns
Output disable time (*2)	tch8	-	5	50	ns

Note:

*1. Input signal rise/fall time should be less than 15ns .

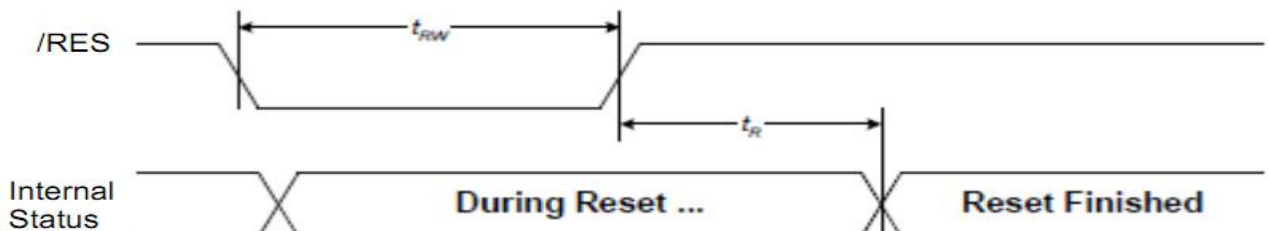
*2. CL=16pF.

*3.All timing is using 20% and 80% of VDD as the reference.

*4.tcclw and tcclr are specified as the overlap between cs1 being "L" and WR and RD being at the "L" level.

*5.For the details of the Display Commands, please refer to ST7567 data sheet.

3.3.2 Reset Timing



$V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25^{\circ}C$

Item	Symbol	MIN.	TYP.	MAX.	Unit
Reset time	tr	-	-	1.0	μs
Reset LOW pulse width	trw	1.0	-	-	μs

Note:

*1.All timing is using 20% and 80% of VDD as the reference.

4. Function specifications

4.1 Basic Setting

To drive the LCD module correctly and provide normally display, please use the following setting

- MX = 0 (normal)
- MY select = 1 (reverse)
- LCD Bias Select = 1/9
- Initial Display Line = 0
- Entire Display ON/OFF = OFF (normal)
- Reverse Display ON/OFF = OFF (normal)
- Set Power Control Set:
 - voltage follower = ON, voltage converter = ON, voltage regulator = ON
- Display ON/OFF = ON

Note:

*1. These setting/commands should issue the LCD module while start up.

*2. See the Display Commands section for details.

4.2 Resetting the LCD module

The LCD module should be initialized by using /RES terminal.

While turning on the VDD and VSS power supply, maintain /RES terminal at LOW level. After the power supply stabilized, release the reset terminal (/RES=HIGH)

4.3 Display Memory Map

Page address	data	LCD Display (front view)		
0	D0 : D7			
1	D0 : D7			
2	D0 : D7			
3	D0 : D7			
4	D0 : D7			
5	D0 : D7			
6	D0 : D7			
7	D0 : D7			
Column Address		00h	→	7Fh

Note:

*1. MX = 0 (normal)

*2. MY Selection = 1 (reverse)

*3. Initial Display Line = 0

4.4 Display Commands

INSTRUCTION	A0	/RD	/WR	COMMAND BYTE								DESCRIPTION
				D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	D	D=1, display ON D=0, display OFF
(2) Set Start Line	0	1	0	0	1	S5	S4	S3	S2	S1	S0	Set display start line
(3) Set Page Address	0	1	0	1	0	1	1	Y3	Y2	Y1	Y0	Set page address
(4) Set Column Address	0	1	0	0	0	0	1	X7	X6	X5	X4	Set column address (MSB)
	0	1	0	0	0	0	0	X3	X2	X1	X0	Set column address (LSB)
(5) Read Status	0	0	1	0	MX	D	RST	0	0	0	0	Read IC Status
(6) Write Data	1	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write display data to RAM
(7) Read Data	1	0	1	D7	D6	D5	D4	D3	D2	D1	D0	Read display data from RAM
(8) SEG Direction	0	1	0	1	0	1	0	0	0	0	MX	Set scan direction of SEG MX=1, reverse direction MX=0, normal direction
(9) Inverse Display	0	1	0	1	0	1	0	0	1	1	INV	INV =1, inverse display INV =0, normal display
(10) All Pixel ON	0	1	0	1	0	1	0	0	1	0	AP	AP=1, set all pixel ON AP=0, normal display
(11) Bias Select	0	1	0	1	0	1	0	0	0	1	BS	Select bias setting 0=1/9; 1=1/7 (at 1/65 duty)
(12) Read-modify-Write	0	1	0	1	1	1	0	0	0	0	0	Column address increment: Read:+0 , Write:+1
(13) END	0	1	0	1	1	1	0	1	1	1	0	Exit Read-modify-Write mode
(14) RESET	0	1	0	1	1	1	0	0	0	1	0	Software reset
(15) COM Direction	0	1	0	1	1	0	0	MY	-	-	-	Set output direction of COM MY=1, reverse direction MY=0, normal direction
(16) Power Control	0	1	0	0	0	1	0	1	VB	VR	VF	Control built-in power circuit ON/OFF
(17) Regulation Ratio	0	1	0	0	0	1	0	0	RP1	RP1	RP0	Select regulation resistor ratio
(18) Set EV	0	1	0	1	0	0	0	0	0	0	1	Double command!! Set electronic volume (EV) level
	0	1	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	
(19) Set Booster	0	1	0	1	1	1	1	1	0	0	0	Double command!! Set booster level: BL=0: 4X BL=1: 5X
	0	1	0	0	0	0	0	0	0	0	BL	
(20) Power Save	0	1	0	Compound Command								Display OFF + All Pixel ON
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	No operation

Note: *1. Symbol “-” means this bit can be “H” or “L”.
*2. For the details of the Display Commands, please refer to ST7567 data sheet.

5. Design and Handling Precaution

1. The LCD panel is made by glass. Any mechanical shock (eg. dropping from high place) will damage the LCD module.
2. Do not add excessive force on the surface of the display, which may cause the Display color change abnormally.
3. The polarizer on the LCD is easily get scratched. If possible, do not remove the LCD protective film until the last step of installation.
4. Never attempt to disassemble or rework the LCD module.
5. Only Clean the LCD with Isopropyl Alcohol or Ethyl Alcohol. Other solvents (eg. water) may damage the LCD.
6. When mounting the LCD module, make sure that it is free from twisting, warping and distortion.
7. Ensure to provide enough space (with cushion) between case and LCD panel to prevent external force adding on it, or it may cause damage to the LCD or degrade the display result.
8. Only hold the LCD module by its side. Never hold LCD module by add force on the heat seal or TAB.
9. Never add force to component of the LCD module. It may cause invisible damage or degrade of the reliability.
10. LCD module could be easily damaged by static electricity. Be careful to maintain an optimum anti-static work environment to protect the LCD module.
11. When peeling off the protective film from LCD, static charge may cause abnormal display pattern. It is normal and will resume to normal in a short while.
12. Take care and prevent get hurt by the LCD panel sharp edge.
13. Never operate the LCD module exceed the absolute maximum ratings.
14. Keep the signal line as short as possible to prevent noisy signal applying to LCD module.
15. Never apply signal to the LCD module without power supply.
16. IC chip (eg. TAB or COG) is sensitive to the light. Strong lighting environment could possibly cause malfunction. Light sealing structure casing is recommend.
17. LCD module reliability may be reduced by temperature shock.
18. When storing the LCD module, avoid exposure to the direct sunlight, high humidity, high temperature or low temperature. They may damage or degrade the LCD module.

